REMARKS

Applicant thanks the Examiner for the thorough consideration given the present application. Claims 1-14 are pending. Claim 1 is independent and is amended. Reconsideration of this application, as amended, is respectfully requested.

Entry of Amendment

Entry of the present Amendment is respectfully requested. It is respectfully submitted that no new issues are raised by this Amendment. The limitation of the coil extending axially is already found in dependent claim 3. Accordingly, incorporating this limitation into claim 1 does not raise a new issue. Entry of this Amendment is, therefore, proper and is requested.

Rejections under 35 U.S.C. §103(a)

Claims 1, 2, 11, and 14 are rejected under 35 U.S.C. §103(a) as being obvious over Mohr (U.S. 4,138,642) in view of Wizenez et al. (U.S. 4,754,464). Claim 3 is rejected as being obvious over Mohr in view of Wizenez et al. and further in view of Lau (U.S. 5,925,950). Claims 4-10 are rejected as being obvious over Mohr in view of Wizenez et al. and further in view of Jones et al. (U.S. 4,039,936). Claims 12 and 13 are rejected as being obvious Mohr in view Wizenez et al. and further in view

of Tajima et al. (U.S. 5,294,851). These rejections are respectfully traversed.

Claim 1 is amended so that it describes a permanent magnet direct current motor having a combination of elements, including a permanent magnet stator, a rotor with a rotor shaft, armature core, armature winding and commutator, and a speed sensor, wherein the sensor is an axially extending coil fixed to the surface of the magnet and located in the air gap. Thus, claim 1 includes the limitation that the coil is axially extending.

The Mohr reference is cited to show an arrangement with a permanent magnet stator, a rotor with a shaft, an armature core and armature winding, and a speed sensor which is a coil. However, the reference does not show a sensor fixed to the surface of a magnet in the air gap.

Wizenez et al. is cited to show a speed sensor fixed to the surface of a pole and located in the air gap. However, it is noted that the sensor of Wizenez et al. is not a speed sensor, but rather a torque sensor, and is not used for monitoring the speed of a motor.

Furthermore, neither Mohr nor Wizenez et al. teaches or suggests a sensor having an axially extending coil. Wizenez et al. shows a Hall sensor device, while Mohr shows a radially

extending coil. Accordingly, amended claim 1 overcomes this two-way combination.

Claim 1 will now be considered with regard to the three-way combination of Mohr, Wizenez et al., and Lau as applied originally to claim 3.

Lau is cited to show a coil which extends axially for monitoring the speed of a motor. The Office Action states that it would be obvious to combine the teachings of the three references, since all are from the same field of endeavor, i.e., motors. It is respectfully submitted that it would not be obvious to combine the teachings of these three references and that if it were obvious, it still would not meet the terms of amended claim 1.

First, it is noted that Wizenez et al. uses a semiconductor member as a Hall device sensor. Such sensors are relatively expensive and, accordingly, are not preferred for use in an inexpensive miniature motor. In addition, in the Wizenez et al. device, torque is sensed rather than speed, and the sensor is not formed on a magnet but rather on an iron pole shoe.

The Mohr reference shows a coil to sense motor speed, but this coil has an axis which is perpendicular to the rotation axis. The Lau reference shows that a multiturn coil can be wrapped

around a flux ring in the axial direction, but does not show the coil mounted on the magnet in the air gap.

Thus, none of the three references teaches the concept of having a simple coil loop mounted on the face of a magnet in the air gap. Mohr shows a coil which is mounted elsewhere and in a different direction. Lau also shows a coil in a different location. Wizenez et al. shows a different type of sensor mounted on a different structure and senses a different parameter. Thus, none of the references teaches or suggests the concept of mounting a coil on a magnet in the air gap.

Furthermore, if the concepts were combined, they still would not teach the presently claimed invention. Thus, if Mohr were modified by Lau, the coil would still not be placed on the face of the magnet in the air gap. Wizenez et al. shows a different type of sensor, also not located on the magnet. Moreover, this does not act as a good teaching of putting a coil arrangement in this location, since a different type of sensor is used. Also, this sensor is placed on a pole shoe rather than a magnet so that this teaching is not sufficient to cause either the teachings of Mohr or Lau to be placed on the face of the magnet in the air gap.

It is respectfully submitted that it would not be obvious to combine these references. First, it is noted that Wizenez et

al. teaches a Hall sensor, which is an expensive type of sensor not practical for the inexpensive miniature motors of the present invention. Furthermore, it would not be an obvious source of teaching to move the coils of either Mohr or Lau, since the sensor is not a coil, and this location would not necessarily be a good teaching of the location of the coil. In addition, since a pole shoe is used rather than a magnet, this teaching would not necessarily be attributable to moving a coil onto a magnet face. Also, since this reference deals with a torque sensor rather than a speed sensor, it also would not be an obvious teaching for one skilled in the art.

Furthermore, it is noted that the Wizenez et al. reference is approximately 45 years old. If one skilled in the art would look to such a reference to place a coil, it would seem that a reference teaching this location would have been apparent during this long time period. Since the Mohr reference is almost 25 years old, if it would have been obvious to combine Mohr and Wizenez et al., it would seem that a teaching would have been present sometime during the 25 years that have elapsed since issuance of the Mohr patent.

It is further noted that the Lau reference is assigned to the Assignee of the present invention. If it were obvious to

add the teachings of this reference to other coil sensors, it would seem that other inventors in the Assignee company would previously have done so. Accordingly, it is respectfully submitted that the presently claimed invention is not obvious over these three references and, furthermore, that it would not have been obvious to one skilled in the art to combine the teachings in the manner suggested in the Office Action.

Furthermore, as pointed out in the previous response, the present invention senses the working magnetic field of a motor, rather than the stray magnetic field. The working field is a more reliable field to sense, since it is strong. Also, there would be no motivation to utilize the location of Wizenez et al. in modifying the coil of Mohr, since the sensors involved are different; therefore, the location would not be interchangeable. For these reasons also, it is respectfully submitted that claim 1 is allowable.

Claims 2-14 depend from claim 1 and, as such, are also considered to be allowable. In addition, these claims further recite the material of the conductive layer, the length of the coil, the specific arrangement of the turns of the coil, and the arrangement of the spring-biased terminals.

With regard to claim 3, Applicants submit that the Lau reference does not show the extent of the coil in regard to the length of the magnet. That is, the coil is wrapped around the flux ring, which may not have the same length as the magnet.

With regard to claim 6, Applicants submit that the Wizenez et al. reference does not teach that the coil extends at the same angle as the poles of the armature core. Wizenez et al. only shows that the sensor extends in the axis of the shoe, but does not discuss the possibility that there may be angle between the armature and the magnet.

With regard to claims 11-13, Applicants submit that the references do not teach or suggest the contacts on the ends of the magnet.

In view of the additional limitation added to claim 1, it is respectfully submitted that the three-way rejection applied against claims 4-10 does not meet the terms of the claims. It is further respectfully submitted that if the Lau reference were added to make a four-way rejection, it would be even less obvious. Similarly, claims 12 and 13 were rejected over a three-way combination. If the Lau reference were added to this, it also would not be obvious to make such a four-way combination.

CONCLUSION

In view of the above remarks, it is believed that the claims clearly distinguish over the references relied upon by the Examiner, either alone or in combination. Accordingly, reconsideration of the rejection and allowance of all claims are respectfully requested.

If there are any outstanding issues, however, the Examiner is invited to telephone Robert F. Gnuse, Reg. No. 27,295, at (703) 205-8000 in an effort to expedite prosecution.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§1.16 or 1.17, particularly extension of time fees.

A marked-up copy of amended claim 1 is attached.

Respectfully submitted,
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1928-121P
Attachment
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MARKED-UP COPY OF AMENDED CLAIM 1

1. (Amended) A permanent magnet direct current motor comprising:

a permanent magnet stator including at least one permanent magnet;

a rotor including a rotor shaft, an armature core mounted on the shaft having a plurality of poles, an armature winding wound about the poles, and a commutator mounted on the shaft adjacent one end of the armature core and connected to lead wires of the armature winding, the rotor being journaled in bearings and located confronting the stator; and

a speed sensor[;]_.

wherein the speed sensor is [a] an axially extending coil of conductive material fixed to the surface of the magnet and located in the air gap between the magnet and the armature core.